PROFILE
PUBLICATIONS

The Curtiss Navy Hawks

NUMBER 116
TWO SHILLINGS

CURTISS BFC-2 HAWK, VB-2B,
Bombing Squadron 2, U.S.S. Saratoga.
(1st aircraft of 3rd Section)

Squadron emblem

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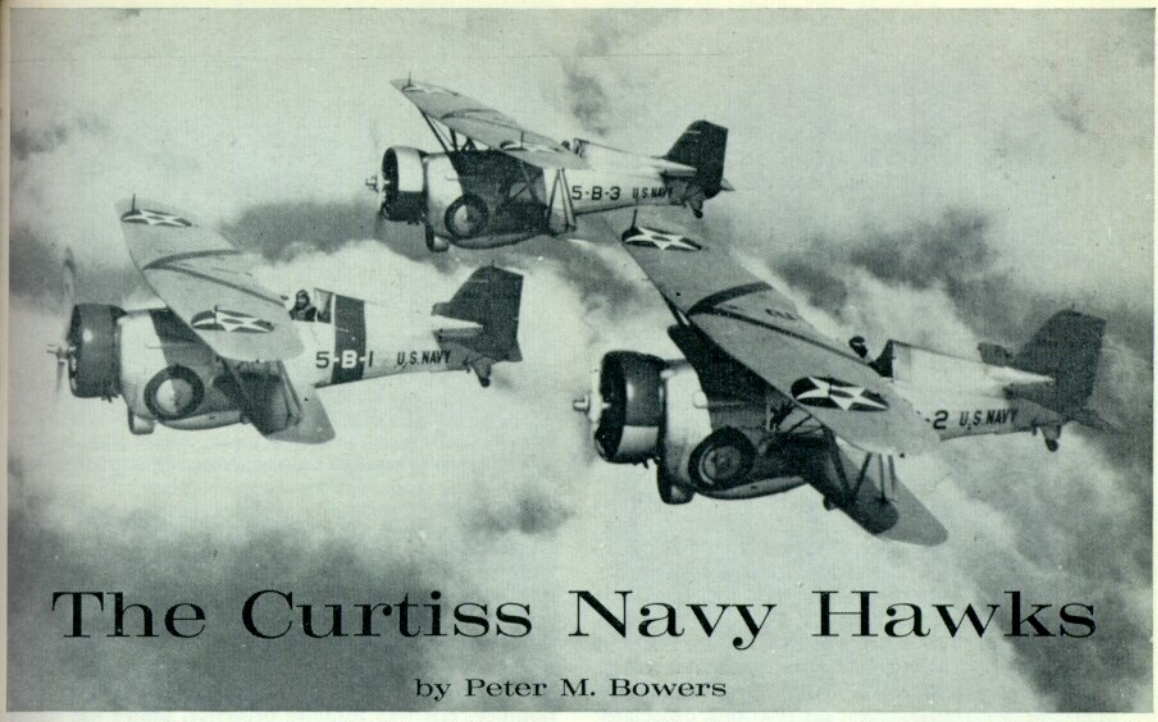


The Curtiss Navy Hawks

by Peter M. Bowers

The first three BF2C-1's of Squadron VB-5B from U.S.S. Ranger, *circa 1934. These comprise the first section of the six-section squadron. Note fuselage stripe and full-colour cowling of leading aircraft, No. 1. No. 2 has top half of cowling coloured but no fuselage stripe. No. 3 has bottom half of cowl coloured. Section colours are red, white, blue, black, green and yellow. 5-B-1 flown by Squadron C.O., Lt. Cmdr. J. D. Barner.* (Photo: U.S. Navy)

Although the Curtiss Hawk biplanes were originally developed for the U.S. Army and achieved their greatest fame in that service (see *Profile* No. 45), they also had a long career as U.S. Navy and Marine Corps fighters and were produced in quantity for export. The original Hawk was a product of the peacetime years and therefore unable to establish a place in history by virtue of a distinguished combat record. The little action that it did see when in its prime was in small-scale wars and border incidents involving the export models but not the U.S. military types. A few obsolescent models saw action in World War II in Siam (now Thailand) and in China.

However, the Hawk was one of the most famous military aircraft of its time, sharing with various Boeings (*Profiles* Nos. 2, 14 and 27) the major fighter rôle in the U.S. armed services from 1925 to 1937. Its distinctive appearance, coupled with the colourful military markings of the time, make it a favourite with model builders today. Of even greater interest to the technical aviation historian is the great amount of individual aircraft modification that took place among the Hawks independently of the normal evolution of the design. In most cases, these are revealed to greatest advantage from the side, which accounts for the preponderance of side-view photographs in this Profile.

ORIGIN OF THE DESIGN

The biplane Hawk traces its origin directly to the Curtiss racers developed for the U.S. Army and Navy in the early post-World War I years. The Curtiss D-12 engine originated in 1918 as the Curtiss-Kirkham K-12. The first production fighter to evolve from this background was the Army Curtiss PW-8 of 1923-25. Various experimental modifications of the XPW-8A, the third XPW-8 prototype, notably the fitting of tapered wings and a tunnel radiator, resulted in the XPW-8B. This was ordered into production for the Army as the P-1 under a revised designation system. The U.S. Navy, which was in need of new land-based fighters at the time, evaluated Army test data and ordered Hawks for its own air arm without formal testing and evaluation of a navy-designed prototype.

Left: *Prototype of the entire Hawk series, the Army XPW-8B of 1924.* (Photo: U.S.A.F.). Right: *The first F6C-1, a land-based fighter, photographed August 7th, 1925.* (Photo: Curtiss)

This first Navy Hawk model, the F6C-1, was the only Navy Hawk that was directly comparable to an Army model. Subsequent models evolved along different lines as dictated by specific Navy-Marine requirements.

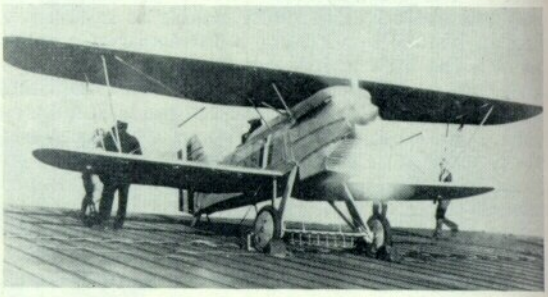
NAVY HAWK DESIGNATIONS

The first Navy Hawk carried the designation of F6C-1. Under the existing system this identified it by type as a fighter (F), the sixth model of that type (6) procured from Curtiss (C), and the initial configuration of that model (-1). Actually, this designation was a chronological misnomer, as the Hawk was only the second Navy Curtiss to carry a standard Navy fighter designation. This resulted from political and economic considerations peculiar to the period. The earlier Curtiss Navy racers (CR-1 through -3, and the R2C and R3C series), while pure racing machines, were listed as fighters on paper although later Navy racers were given actual fighter designations. When Curtiss developed a metal version of the Naval Aircraft Factory's TS-1 fighter, it was given the designation of F4C-1 since it followed the R3C/F3C design. While F5C was the logical designation for for next Navy Curtiss fighter model, the Hawk, it was skipped deliberately because the Navy still had a large number of WW-I vintage F-5L flying boats in service under their original designations. It was felt that confusion would result from the simultaneous use of aircraft with such similar disignations, especially since some of the F-5L's were built by Curtiss and were referred to as Curtiss F-5L's. The Hawk therefore became F6C-1.

Minor variations and developments of the F6C-1 model were identified by changes to the dash number, as -2, -3, etc. Only three versions of the F6C were ordered into production, the F6C-1, -3, and -4.

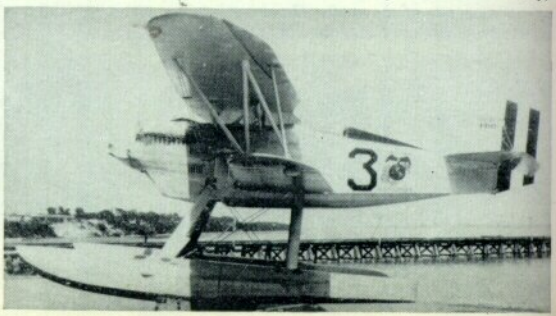
F6C-1, A-6969, leader of Squadron VF-2. Note unusual application of squadron numbers to upper wing. (Photo: U.S. Navy)

All others were conversions of these three. New Curtiss Navy fighter models that followed the F6C were given following numbers, F7C, F8C, etc., and finally reached F15C at the end of WW-II. A later version of the Hawk that appeared in 1932 was so different from the original 1925 model that it was given an entirely new model number—F11C. This, like the F6C, served in the dual rôle of fighter and bomber, but was initially procured under the fighter designation. In March, 1934, the two production versions of the F11C were redesignated as bomber-fighters when new designations were assigned to dual-purpose aircraft. The F11C-2 became the BFC-2 and the F11C-3 became the BF2C-1. It is interesting to note that the retractable-undercarriage F11C-3 was considered to be merely an F11C variant



Left: *The 7th F6C-1, A-6974, converted to F6C-2, a replacement leader of VF-2. Note new undercarriage and fuselage bomb rack.* Right: *F6F-2 A-6973 aboard* U.S.S. Langley. *Note undercarriage spreader bar and guide hooks.* (Photo: U.S. Navy)

Left: *F6C-3 A7143 fitted with F6C-4 undercarriage in place of the original -2 type.* Right: *F6C-3 A-7147 modified for 1930 Curtiss Marine Trophy Race. Note deepened belly, reduced cockpit cutout, and elongated headrest.* (Photo: U.S. Navy)



under the fighter designation but was regarded as a separate model when it became a fighter-bomber.

The letter "X" to denote experimental aircraft was not used by the Navy at the time it adopted the F6C. It came into use in 1927, and was promptly applied to several F6C Hawks that had been diverted to experimental work. There were three experimental prototypes in the F11C Hawk series and all were given the X-prefix—XF11C-1, -2, and -3. This X was retained when the F designation of the prototypes was changed to BFC and BF2C.

CURTISS FACTORY DESIGNATIONS

Until the end of WW-I, the Curtiss factory used a letter and number system to identify its different models (see JN-4, Profile No. 37). From 1919, it did not follow a rigid system but used several different systems within the plant. For sales, publicity, and civil registration records, it used names for the different models. The early Hawks were just that, with Army, Navy, and export models all being called Hawk regardless of detail differences. Army and Navy models were identified by their service designations in company engineering and photo records and to some degree in advertising. Variations of export models were sometimes distinguished by the customer's identity, as "Japan Hawk", or by a particular installation, as "Wasp P-6" for a demonstrator model that was similar to the Army P-6 except for the fitting of a P & W "Wasp" engine. Later, major structural variations were identified by number, and the aircraft were advertised as "Hawk I" to "Hawk IV".

About 1934, Curtiss adopted a numbered model identification system with variants further identified by a suffix letter. This system did not start with Model No. 1 for the first produced under the new arrangement, but started high, at 75, with the preceding numbers applied retroactively in a valiant attempt to sort out the many previous Curtiss models. The early Hawks (Army P-1 and Navy F6C) became Model 34, the later Army P-6 and Export Hawk I became Model 35, the F11C became Model 64, the export Hawk II became Model 65, and the BF2C-1 became Model 67. The later export Hawk IV became Model 79.

NAVY SERIAL NUMBERS

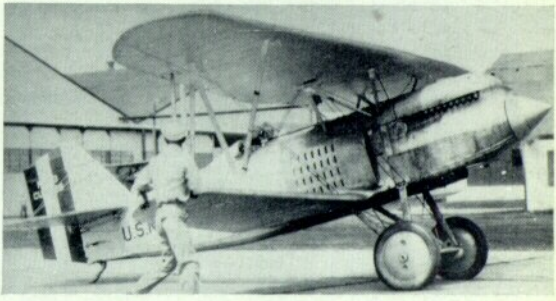
Individual aircraft in the U.S. Navy, as in other armed services, are identified by a service serial number. Because of the many variants of a single model described, identification of individual aircraft by Navy serial number is very important to this Profile.

The Navy serials ran consecutively from *No. 1* in 1911 until *9999* was reached in 1935, when a new series started anew at *0001*. All Navy Hawks were in the first series. Numbers in this one series were prefixed with the letter A (for airplane) until 1932, when the letter was deleted.

DEVELOPMENT OF THE DESIGN

While there was great detail change in both the Army and the Navy Hawks throughout their development life, the basic design remained essentially that of the common prototype, the XPW-8B. This featured a welded steel tube fuselage, rivetted metal frame tail surfaces, and tapered wooden wings, all fabric covered. The upper wing was a single unit, with parallel box spars. The ribs were cut from plywood reinforced with cap strips. Ailerons, in the upper wing only, were operated by a push rod from the lower wing. The original powerplant was the water-cooled Curtis D-12 engine, an upright V-12 producing 400 h.p. at sea level in its Navy version. A unique

F6C-3 A-7144 fitted as a seaplane while serving with VB-1 in 1928. (Photo: U.S. Navy)



F6C-3 A-7114 modified for racing with radiator inside fuselage, low-drag undercarriage, and rear fuselage and belly rounded out with superstructure. (Photo: U.S. Navy)

F6C-3 A-7144 as entered in the 1929 National Air Races under designation of F6C-6. (Photo: Charles Yeager)

F6C-3 A-7144 restored to near-standard configuration with -4 undercarriage, circa 1930. Only the rounded rear fuselage contours remain from its racing days. (Photo: U.S. Navy)

feature of this engine was that it had two intake and two exhaust valves per cylinder. The radiator was installed in a distinctive "tunnel" housing beneath the engine. Armament was standard for American fighters of the period, a pair of synchronized Browning ·30 calibre machine guns or a single ·30 and one ·50 cal. installed ahead of the cockpit and under the turtledeck so that only the forward tips of the blast tubes projected from the front of the engine cowling. In the F6C series, a small load of bombs could be carried on racks under the fuselage or wings. Two sizes of auxiliary fuel tank, 30 or 50 U.S. gallons, could be attached under the fuselage. Specification and performance tables for early and late Navy Hawks will be found on page 12.

F6C-1—Nine near-duplicates of the Army P-1 were procured as shore-based fighters at the time the Army production order was placed in 1924. The first test flight of an F6C-1, identified as Curtiss Model 34C, was made in August, 1925, Navy serial numbers were *A-6968* to *A-6976*. The last four were held back for completion as F6C-2 and two, *A-6970* and *A-6972* eventually became F6C-3. One, *A-6970*, was tested on twin floats but this feature did not become standard for F6C-1's. Gross weight of the seaplane increased to 3,257 pounds and the service ceiling was reduced to 19,000 feet. After Navy test, the first F6C-1 was returned to the factory for installation of the new air-cooled Pratt & Whitney R-1340 "Wasp" engine in which the Navy was vitally interested, and was redesignated F6C-4.

With only four F6C-1's on hand, they did not serve in squadron service but were mixed with other types in Fighting Squadrons 1 and 2. Three were transferred to the U.S. Marine Corps in 1927, where two survived until 1932.

F6C-2—The last four machines on the original F6C-1 order *A-6973* to *A-6976*) were converted at the factory to F6C-2 (Curtiss Model 34D) prior to completion. The significant change was the fitting of deck arrester gear and a redesigned undercarriage that was better suited to deck landings. This featured a spreader bar to which were affixed hooks that engaged longitudinal cables on the ship's deck to keep the airplane running straight. These features increased the gross weight to 2,833 pounds and reduced the top speed to

The first F6C-1, A-6968, after installation of P & W "Wasp" radial engine and redesignation as F6C-4. Note spinner, bayonet exhaust stacks, and large belly tank. (Photo: Arthur E. Price)

The first production F6C-4, A-7393, introduced an entirely new undercarriage. (Photo: Stephen J. Hudek Collection)

Lt. Cdr. J. D. Barner of VB-5B flying his BF2C-1 from U.S.S. Ranger. *Note details of markings and structure.* (Photo: U.S. Navy)

F6C-4 A-7404, a/c No. 5 of Marine Squadron VF-10M, circa 1931. This is the only known case of the application of U.S. insignia beneath the upper wing of a biplane since W.W.I. (Photo: U.S. Navy)

Marine Corps F6C-4, A-7394, fitted with F6C-1 undercarriage. This was common practice with Marines, who did not operate their F6C's from aircraft carriers. (Photo: N.A.C.A.)

169 m.p.h. Service ceiling increased to 22,700 feet, however, because of better engine/altitude performance. The F6C-2's, delivered in November, 1925, remained in service with the fleet through 1928.

F6C-3—Thirty-five production versions of the F6C-2 were ordered as F6C-3 (Curtiss Model 34E) and two F6C-1's (*A-6970* and *A-6972*) were converted. Serial numbers of the production versions were *A-7128* through *A-7162* and deliveries began in January, 1927. The -3 differed from the -2 in essentially the same details of increased structural weight that distinguished the Army Hawk P-1A from the P-1. The F6C-3 originally used the undercarriage of the F6C-2, but when the longitudinal deck wire arrangement was abandoned in 1927, the carrier-based F6C-3's were fitted with a new undercarriage that had since appeared on the F6C-4. F6C-3's used by the Marine Corps as shore-based fighters (they had eight in 1927 and retained them into 1931) were fitted with the older F6C-1 undercarriage that duplicated that of the Army P-1 series. One complete Navy squadron, VB-1B, used the F6C-3 as a twin-float seaplane for a short period in 1928.

One F6C-3, *A-7147*, was fitted out by the Marine Corps as a racing seaplane and entered in the 1930 Curtiss Marine Trophy Race. Piloted by Captain Arthur H. Page, the modified seaplane averaged 164 m.p.h. around the 20 mile triangular course to take the trophy on May 31st, 1931. Immediately after this victory, *A-7147* was returned to the factory for a complete rebuild from which it emerged as the special XF6C-6 monoplane racer. The standard F6C-3's were withdrawn from first-line duty with the fleet late in 1928 in keeping with the Navy's new policy of using only aircraft with air-cooled engines for such service. However, the F6C-3 was already at a disadvantage with its contemporaries, since its increased weight, 2,963 pounds for the landplane, imposed a speed reduction to 153·6 m.p.h. and reduced the service ceiling to 20,300 feet.

XF6C-3—One standard F6C-3, *A-7136*, was diverted to test work and was given the X-for-Experimental prefix that the Navy adopted in 1927.

F6C-4—The first F6C-1, *A-6968*, was returned to the factory for the experimental installation of the new 410 h.p. Pratt & Whitney "Wasp", a nine-cylinder air-cooled radial engine (R-1340) developed in 1926 under Navy sponsorship. Redesignated F6C-4 (Curtiss Model 34H), which would have been XF6C-4 had the Navy used that prefix in 1926, the airplane featured a large spinner fitted to the propeller in an attempt to overcome the great drag increase imposed by the radial engine.

The new installation was successful, and an order was placed for 31 production F6C-4's with serial numbers *A-7393* through *A-7423*. The first of these delivered in February, 1927, featured the large spinner of the prototype, but it was not used in service. The major change from the prototype, which underwent another engine change and became XF6C-5, was the fitting of a redesigned undercarriage better adapted to the revised deck landing system.

The F6C-4's had a relatively short squadron life in the Navy, serving with VF-2B on the U.S.S. Langley in 1929 and 1930 before being sent to Pensacola for use as advanced trainers. The Marines obtained four in 1927 and refitted them with the F6C-1 type undercarriage. By 1931, the Marines had a total of 12 F6C-4's on hand, most serving with VMF-10 at San Diego, California.

XF6C-4—The first production F6C-4, A-7393, was used by the Navy for test work and was redesignated as XF6C-4.

PF6C-5—The first F6C-1, *A-6968*, underwent a second engine change after becoming the prototype F6C-4. When fitted by the Navy with the later 525 h.p. P. & W. "Hornet" radial engine (R-1690) it was redesignated XF6C-5. As such, it served briefly with Marine Fighter Squadron VF-9M late in

After becoming F6C-4 by engine change, the first F6C-1, A-6968, became the XF6C-5 when a P & W "Hornet" engine and production F6C-4 undercarriage were installed in 1927. (Photo: U.S. Navy)

F6C-3 A-7147 was returned to the factory after winning the 1930 Curtiss Marine Trophy Race and was completely rebuilt as the XF6C-6 monoplane for the 1930 National Air Races. (Photo: Curtiss)

Left: *The XF7C-1 was F6C-4, A-7403, fitted with an inverted air-cooled Ranger V-12 engine.* (Photo: N.A.C.A.). Right: *The 1932 version of the Hawk was sufficiently different to justify a new model number. This is XF11C-1 Navy Serial No. 9219.* (Photo: U.S. Navy)

1927, using the production F6C-4 undercarriage but no arrester gear. The gross weight of the XF6C-5 increased 630 pounds over the production F6C-4 to 3,415 pounds, so the additional power increased the top speed only 4·5 m.p.h. to 159·5 m.p.h. while the service ceiling decreased to 21,900 ft.

F6C-6—One standard F6C-3, *A-7144*, was modified by the Navy as its entry in the 1929 U.S. National Air Races but was not given an experimental designation. In the interest of improved streamlining, the standard tunnel radiator was removed and a new radiator was built into the fuselage behind the engine, the necessary cooling air being taken in through scoops in the fuselage sides. A shorter undercarriage, wire-braced with a cross-axle, was fitted, and the fuselage contours were rounded out by the addition of stringers to the otherwise flat sides and bottom. The machine was flown in this configuration as F6C-3 before the addition of wheel fairings and a change of designation to F6C-6. At the end of its racing career, the F6C-6 was reconverted to F6C-3 configuration with F6C-4 undercarriage while retaining the rounded fuselage of the racer and the designation was changed back to F6C-3.

XF6C-6—The F6C-3 seaplane, *A-7147*, was returned to the Curtiss factory after it won the 1930 Curtiss Marine Trophy. There it was completely redesigned and rebuilt, becoming a monoplane with the designation of XF6C-6. Curtiss did not assign a new model number. Although flown by the same Marine Captain Page who won the Marine Trophy, the XF6C-6 was now a Navy machine, to be entered in the 1930 National Air Races. In the aviation press of the time, it was known as "The Page Navy Racer" after its pilot rather than by its official designation. The most notable change, of course, was the deletion of the lower wing. The upper wing was moved aft a few inches to maintain proper balance. Other major changes were the fitting of an extremely clean single-strut undercarriage, replacement of the traditional tunnel radiator with the wing-surface radiators of the Curtiss racers of the early 1920's, and the improved streamlining of the fuselage. Less noticeable was the substitution of a special Curtiss V-1570 "Conqueror" engine of 600-plus horsepower for the D-12. This engine was the equivalent of those used in the contemporary Army P-6 Hawk series.

The full capability of the XF6C-6 was never determined. It was leading the field in the 1930 Thompson Trophy Race, held at Chicago on September 1st, when it crashed in the 17th lap. No mechanical failure was evident, and it is believed that Captain Page was overcome by carbon monoxide fumes from the exhaust.

XF6C-7—The last model in the F6C Hawk series was not an attempt to improve the basic design. In 1932 the Naval Aircraft Factory at Philadelphia installed an experimental Ranger SGV-770 air-cooled engine in F6C-4 *A-7403*. This was an inverted 12-cylinder Vee, geared to produce a rather remarkable 550 h.p. from its 770 cubic inch displacement. The Hawk was chosen merely to have a fighter type flying test bed for the new powerplant. While the designation of XF6C-7 was actually assigned, the original designation on the airplane's rudder was not changed.

XF11C-1—After being out of production since early 1928, the Hawk design was revived and offered again to the Navy in 1932 in considerably altered form. It continued the F6C-4 concept of the radial engine, but used an adaption of the ZF6C-6 single-

Although carrying a later designation but earlier serial number, 9213, the XF11C-2 was an older airplane than the XF11C-1. Note longer undercarriage legs. (Photo: U.S. Navy)

The XF11C-2 was soon modified to incorporate features of XF11C-1, notably belly tank/bomb and cutout in rudder for relocated tailwheel. Photo: U.S. Navy)

strut undercarriage which had been adopted by the Army for the P-6E Hawk after test on the XP-22. Appearance was altered slightly by the fact that the wing gap was increased by nearly four inches. On the XF11C-1, a tail wheel was installed at the very end of the fuselage, with a cut-out made in the bottom of the rudder to accommodate a shock absorber. The engine was a new experimental model Wright R-1510 twin-row 600 h.p. twin row radial engine fitted with a three-blade propeller. Unlike the F6C and the Army Hawks, the ailerons and all the tail surfaces of the XF11C-1 were metal covered.

Since the XF11C-1 was intended to serve as a dive bomber as well as a fighter, its bombing system differed considerably from that of the F6C. A single 500 lb. bomb could be carried on a swinging rack under the belly. This permitted the bomb to be moved to a position well below the fuselage, where it would fall clear of the propeller when dropped in a steep dive. When the bomb was not carried, a 50 U.S. gallon streamlined belly tank, looking very like a bomb, could be carried on the rack.

The XF11C-1, Navy serial *9219*, was one of two experimental F11C's ordered by the Navy in April, 1932. The other was the XF11C-2. The XF11C-1 (Curtiss Model 64) was used only for test work after its delivery in September, 1932. It became XBFP-1 in March, 1934, when the dual-purpose designation was adopted. It was turned over to the National Advisory Committee for Aeronautics (N.A.C.A.) as a research airplane in 1936.

XF11C-2—Although carrying a later designation, the XF11C-2 (Curtiss Model 64A) was a considerably older airplane than the XF11C-1, and was flying a month before the -1 was contracted for. It had been built as a company demonstrator. Negotiations for the Navy contract were under way well in advance of the actual signing, and it was known what the designations of the airplanes would be, so the designation XF11C-2, but no serial number, was painted on the airplane for its test flights.

The major difference from the XF11C-1 was the use of the 700 h.p. Wright R-1820E "Cyclone" engine, longer legs for the undercarriage, low-pressure tyres, and fabric covering for the tail surfaces. A tailwheel was fitted, but it was well ahead of the tail post. This was soon changed to the aft location chosen for the XF11C-1, and a similar cutout was made in the bottom of the rudder for the shock absorber. The XF11C-2 did not originally have the swinging bomb rack of the -1. Bombs were carried on racks under the wing and a belly tank of the type used on the F6C series and the Army Hawks could be carried. The belly rack was soon changed to the swinging type, but the wing bomb racks were retained and the old style belly tank was replaced by the new. The XF11C-2 won a production order for 28 similar models with slight changes. The most direct production equivalent, however, was the Export Hawk II (Curtiss Model 65).

F11C-2—The 28 production F11C-2's were ordered in October, 1932, and were assigned Navy serial numbers *9265* to *9292* and *9331* to *9340*. *No. 9269* was held back for conversion to a new prototype, the XF11C-3. The F11C-2's were notably different from the XF11C-2 in having high-pressure tyres. All were delivered to Navy squadron VF-1B aboard the U.S.S. Saratoga in February, 1933. Their lives as F11C-2's was relatively short, for in March, 1934, they became BFC-2. Later, the squadron was redesignated, becoming VB-2B and then VB-3B, still the same organization serving on the same ship.

Left: *Production F11C-2's served only a year under that designation. This is serial 9270 serving with VF-1B aboard the* U.S.S. Saratoga: *aircraft No. 4 is leader of Second Section.* Right: *The XF11C-1 became XBF-1 in 1934. Here it is shown with experimental cowling and lengthened undercarriage during engine cooling experiments at N.A.C.A.* (Photo: N.A.C.A.)

The XF11C-3 was converted from production F11C-2 serial 9269. (Photo: U.S. Navy)

XF11C-3—The fifth production F11C-2 was converted at the factory before delivery to the prototype of an improved model identified by the Navy as XF11C-3 and by Curtiss as Model 67. This airplane was essentially an F11C-2 fitted with a retractable undercarriage. The original powerplant was the 700 h.p. Wright R-1820-80 "Cyclone" fitted with a fixed-pitch propeller. Later, this was changed to a controllable pitch model. There was no production F11C-3 as such. The designation was changed before delivery, the prototype becoming XBF2C-1 and the 27 production models BF2C-1. The equivalent export model was the Hawk III (Curtiss Model 68).

XBFC-1—The XF11C-1 redesignated in March, 1934. Retained the original cockpit and upper fuselage details after redesignation.

XBFC-2—The XF11C-2 redesignated.

BFC-2—The production F11C-2's redesignated. At this time, the cockpits and upper rear fuselage details were revised and a partial canopy was fitted to the cockpit. The BFC-2's were withdrawn from fleet service in 1938.

XBF2C-1—The XF11C-1 redesignated. Cockpit and upper fuselage modified in manner of the BFC-2 at time of redesignation. Controllable propeller also fitted at this time.

BF2C-1—Twenty-seven production versions of the XF11C-3/XBF2C-1 with Navy serial numbers *9586* through *9612*. Curtiss Model 67A. The upper fuselage and cockpit and the controllable propeller matched the latest modifications to the prototype.

The BF2C-1's had a service life of barely a year. Assigned to Squadron VB-5 aboard the U.S.S. Ranger, they had serious mechanical problems, mainly associated with the retractable undercarriage, that made them unsuitable for fleet operations. The equivalent export model, fitted with a completely enclosed cockpit, was the Hawk IV, Curtiss Model 79. By the time this appeared it was quite evident that the biplane Hawk had reached the limit of its growth, and only one Hawk IV was built.

Left: *The F11C-2's were redesignated BFC-2 in 1934. Note wing bomb racks and bomb-like auxiliary fuel tank on this aircraft.* (Photo: E. M. Sommerich Collection). Right: *Compare cockpit and aft fuselage details of BCF-2 with F11C-2. Squadron VF-1B was redesignated and became VB-2, still with red tail and the high hat insignia.* (Photo: John C. Mitchell)

Left: *The "High Hat" Squadron underwent a further redesignation, becoming VB-3 and changing the tail colour of its BFC-2's to white.* (Photo: William T. Larkins). Right: *The final form of the Curtiss biplane Hawk—the export Hawk IV.* (Photo: Curtiss)

F6C-3 Hawk of VB-1B, Bombing Squadron One, "The Red Rippers"; third a/c of 1st section; U.S.S. Lexington.

"Winged Devil" emblem of VF-10M.

F6C-4 Hawk of VF-10M, Marine Fighting Squadron Ten; U.S.M.C., 1931.

Emblem of VB-1B, "The Red Rippers".

F11C-2 Hawk of VF-1B, Fighting Squadron One; first a/c of 2nd section; U.S.S. Saratoga

VF-1B "High Hats" also VB-2B, VB-3B.

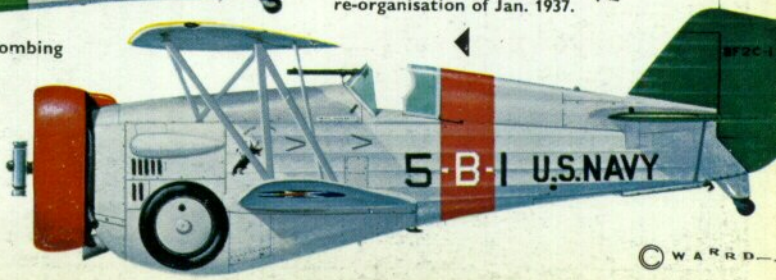
F11C-2 Hawk of VF-1B, Fighting Squadron One; first a/c of 3rd section; U.S.S. Saratoga.

BFC-2 Hawk of VB-2B, Bombing Squadron Two; first a/c of 1st section; U.S.S. Saratoga.

Emblem of VB-5B, Bellerophon and Pegasus; Greek motto reads "First to Attack". Plume and shield painted in section colours.

BFC-2 Hawk of VB-3B, Bombing Squadron Three; U.S.S. Saratoga. Note that tail colours were changed during Fleet squadron re-organisation of Jan. 1937.

BF2C-1 Hawk of VB-5B, Bombing Squadron Five; U.S.S. Ranger.



U.S.N. Section Identification Colours.

1st, 2nd, 3rd, 4th, 5th, 6th

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Production BF2C-1 serial number 9601, serving with VB-5 aboard U.S.S. Ranger. (Photo: A. U. Schmidt Collection)

COLOURING

At the time the Navy bought the F6C-1, standard colouring was silver over all with orange-yellow on the upper surface of the upper wing and horizontal tail. In the late 1920's, metal parts were painted a light gray while the fabric remained silver. By 1934, the metal parts were again painted silver.

In 1925-26, practically all U.S. Navy aircraft were identified with three vertical red, white, and blue rudder stripes similar to those used by Britain and France. In 1926, the custom of painting the entire tail assembly in a solid colour to identify a particular squadron was adopted. By 1928, the vertical stripes were no longer used on first-line Navy combat craft although they were retained by the U.S. Marines until the adoption of camouflage in 1941. The solid colouring continued to identify specific squadrons until 1937, when the system was changed to have the colour identify the aircraft carrier to which the squadron belonged. These were as follows:

Red—U.S.S. Langley
White—U.S.S. Saratoga
Blue—U.S.S. Enterprise
Black—U.S.S. Yorktown
Green—U.S.S. Ranger
Yellow—U.S.S. Lexington

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The XF11C-3 with controllable propeller and modified fuselage after redesignation as XBF2C-1. (Photo: U.S. Navy)

NAVY CURTISS HAWK SPECIFICATIONS

	F6C-1	F6C-4	BFC-2	BF2C-1
Wing Span (Upper) ...	31 ft. 6 in.	31 ft. 6 in.	31 ft. 6 in.	31 ft. 6 in.
Wing Span (Lower) ...	26 ft. 0 in.	26 ft. 0 in.	26 ft. 6 in.	26 ft. 6 in.
Length	22 ft. 7⅞ in.	22 ft. 5 in.	25 ft. 0 in.	23 ft. 0 in.
Wing Area	252 sq. ft.	252 sq. ft.	262 sq. ft.	262 sq. ft.
Empty Weight	2,059 lb.	1,980 lb.	3,111 lb.	5,086 lb.
Gross Weight	2,802 lb.	2,785 lb.	4,712 lb. (B) 4,194 lb. (F)	5,086 lb. (B) 4,555 lb. (F)
Powerplant	Curtiss D-12 400 h.p. at 2,200 r.p.m.	P. & W. R-1340 410 h.p. at 1,900 r.p.m.	Wright R-1820-78 700 h.p. at 1,950 r.p.m. at 4,000 ft.	Wright R-1820-4 700 h.p. at 8,000 ft.
Fuel Capacity	100 Gal.	100 Gal.	94/146 Gal.	110/60 Gal.
0·1 Capacity	6·6 Gal.	6·6 Gal.	10·5 Gal.	13 Gal.
Top Speed	163·5 m.p.h.	155 m.p.h.	197·9 m.p.h. at 4,000 ft.	215 m.p.h. at 8,000 ft. (B) 225 m.p.h. at 8,000 (F)
Stalling Speed	59·8 m.p.h.	57·9 m.p.h.	69·2 m.p.h. (B) 65·3 m.p.h. (F)	73 m.p.h. (B) 69 m.p.h. (F)
Rate of Climb	2·9 Min. to 5,000 ft.	2·5 Min. to 5,000 ft.	3·2 Min. to 5,000 ft. (B) 2·6 Min. to 5,000 ft. (F)	3·1 Min. to 5,000 ft. (B) 2·6 min. to 5,000 ft. (F)
Service Ceiling	21,700 ft.	22,900 ft.	20, 700 ft. (B) 24,000 ft. (F)	24,000 ft.
Range	383 Mi.	321 Mi.	560 Mi.	797 Mi.

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